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PROCESS AND APPARATUS FOR THE CONTINUOUS TREATMENT OF LOOSE FIBROUS MATERIALS

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ABSTRACT OF THE DISCLOSURE

The present disclosure relates to a process and apparatus for the continuous treatment, particularly for dyeing loose fibrous material such as for example wool, cotton, viscose staple fiber, synthetic staple fiber and the like. More particularly, the present disclosure is directed to a process and apparatus for continuously dyeing loose fibrous material wherein said material is impregnated with a dyeing liquor, squeezed, treated in a steam atmosphere to achieve dyestuff setting, washed, and finally dried.

BACKGROUND OF THE INVENTION

The present invention relates to a process and apparatus for the continuous treatment, especially for dyeing of loose fibrous stock, for example, wool, cotton, viscose staple fiber and synthetic staple fiber such as for example PACN.

It is well known to continuously dye piece goods, tow, top, slivers, etc. However, it is difficult to obtain a uniform level of dyeing. These difficulties can be avoided when dyeing loose fibrous stock since the individual fibers can be blended in subsequent processing stages so that the yarns and piece goods show a completely level shade. When manufacturing mixture yarns, fibrous materials dyed to different shades are previously mixed so that the desired irregular mixture shade is obtained in the yarn and the finished articles.

Loose fibrous stock is generally dyed discontinuously. Attempts to dye loose fibrous stock continuously have been met with substantial difficulties up to the present time. On the one hand, a uniform impregnation with the dyeing liquor cannot be obtained whereas on the other hand a proper continuous transportation through the individual treatment units is not ensured with most of the known units for piece goods, top slivers, tow and the like.

SUMMARY OF THE INVENTION

An object of the present invention is to avoid the prior art disadvantages in the continuous treatment, especially for the dyeing of loose fibrous material.

Another object of the present invention is to provide an improved process and apparatus for the continuous dyeing of loose fibrous material wherein a uniform impregnation of the dyeing liquor is achieved.

Other objects and further scope of applicability of the present invention will become apparent from the detailed description given hereinafter; it should be understood, however, that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

Pursuant to the present invention, it has been found that the above-mentioned disadvantages may be eliminated and much improved process and apparatus for the continuous treatment, especially for a uniform impregnation of the material with the dyeing liquor, can be obtained if during the treatment process the loose fibrous stock is formed as a coherent fleece of uniform thickness. For the treatment, especially for dyeing of loose fibrous stock, for example wool, PACN, etc., and to ensure a level dyeing, it is suggested according to the present invention to form a loose fleece of loose fibrous stock, to impregnate the fleece with the dyeing liquor followed by subsequent squeezing, to provide a dwelling time for the material in a treatment chamber, preferably in a steam atmosphere for a time sufficient to achieve dyestuff setting, to subsequently wash the material and finally to dry it and possibly to open it during and/or after the continuous treatment operation.

In a further embodiment of the present invention it is suggested to form the fleece by means of a hopper feeder and a vibration chute and possibly an opener between the hopper feeder and the vibration chute and to apply the dyeing liquor by means of a spraying device disposed above the vibration chute and a squeezer correlated to the vibration chute. It is advantageous if the dyeing liquor is applied in excess.

According to another embodiment of the present invention it is suggested to form the fleece by means of a hopper feeder and a suction drum bowl, preferably with a floating zone and possibly also an opener behind the hopper feeder, whereby the dyeing liquor application is effected in the suction drum bowl.

The apparatus for carrying out the aforementioned process which ensures a proper material transportation comprises a combination of the following individual units:

(a) A hopper feeder, possibly with an opener, preferably with a fine opener,
(b) a combined fleece-forming and impregnating device with a squeezer,
(c) a belt steamer which advantageously is provided with a cross-current blower,
(d) several suction drum bowls with squeezers disposed therebehind,
(e) a sieve drum dryer, and
(f) a common control and regulating device for the aforementioned units.

In a further embodiment, the apparatus of the present invention can be extended by providing the steamer with a special device, for example a hopper feeder by means of which the thick fiber fleece which leaves the steamer is rearranged to form a substantially thinner fleece which is passed on to the suction drum bowls. Advantageously, an opener is disposed behind the suction drum bowl so that the fiber fleece can be dried in a more uniform manner. In many cases it will be sufficient if at the point of passage between the conveyor belt of the steamer and the feeding belt to the first suction drum bowl and subsequent suction drum bowls a squeeze roller is correlated to each conveyor belt in order to facilitate the proper rearrangement of the fiber fleece at the point of passage.

A steamer which is especially suitable for this apparatus is provided with a steam-permeable conveyor belt on which the material is passed through the treatment chamber and which extends out of the treatment chamber at the discharge end and/or the outlet end of the device. In order to obtain the required dwelling times of, for example about 5–20 minutes for dyeing, even with a larger production, it is suggested to feed the loose fibrous stock onto the conveyor belt of the streamer in a substantially thicker layer, for example about a 10–20 fold thickness as compared with the impregnating device. In

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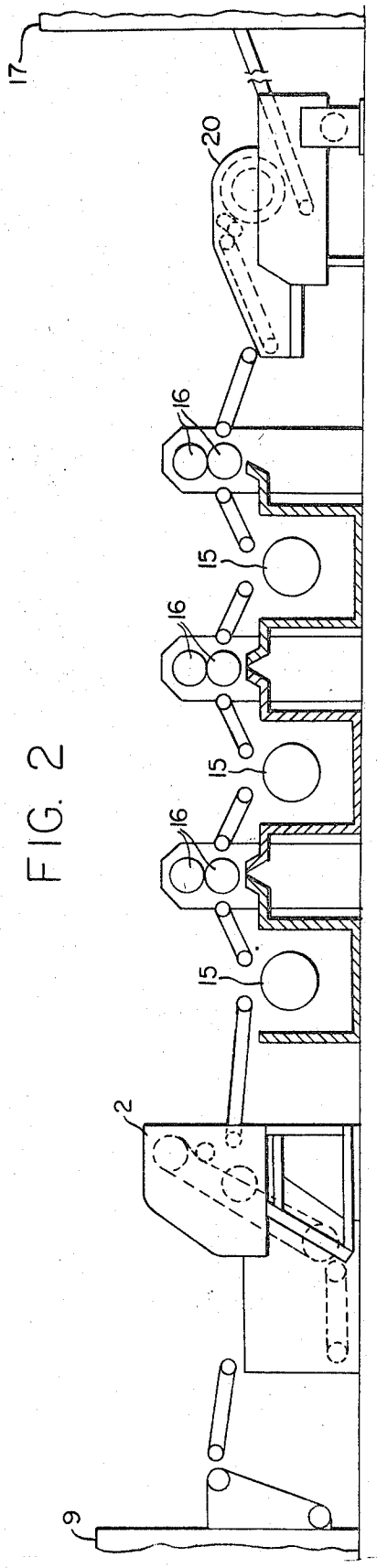


FIG. 2

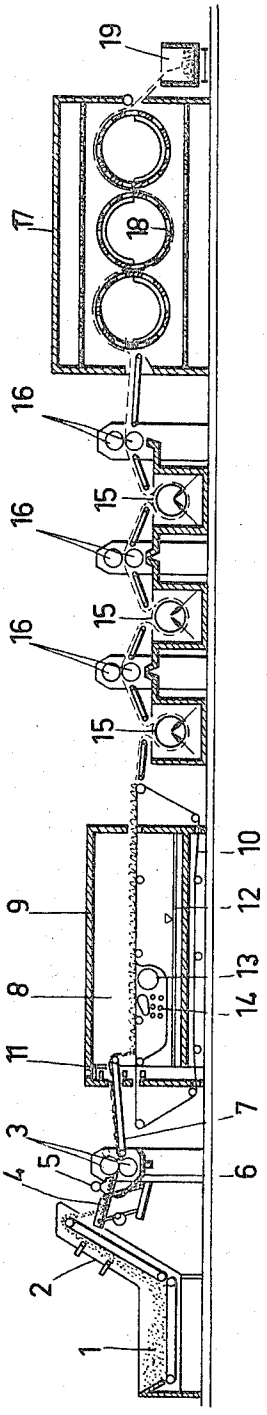


FIG. 1

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vided with a conveying belt means and a cross-current blower disposed beneath the conveyor belt near the inlet of said chamber, at least one suction drum bowl provided behind the steam treatment chamber said suction drum bowl associated with a squeezer means disposed therebehind and a sieve drum dryer means disposed after the suction drum bowl for drying the material being treated.

14. The apparatus of claim **13** wherein between the steam-treatment chamber and the suction drum bowl a hopper feeder is arranged wherein the thick fiber fleece leaving the steam-treatment chamber is rearranged to form a thinner fiber fleece which is fed to the suction drum bowl.

15. The apparatus of claim **13** wherein conveyor belts provide communication between the conveyor belt of the steam-treatment chamber and the first suction drum bowl and between the suction drum bowl and the squeezer means.

16. The apparatus of claim **13** wherein a heating means is associated with the cross-current blower for heating the treatment medium.

17. The apparatus of claim **13** wherein a heated sump is provided in the low portion of the steam-treatment chamber.

18. The apparatus of claim **13** wherein the conveyor belt is returned from the outlet to the inlet of the steam-treatment chamber, beneath said chamber.

19. The apparatus of claim **13** wherein an ante-chamber subjected to a suction draft is provided at the inlet of the steam-treatment chamber.

20. The apparatus of claim **13** wherein the feeder means comprises a hopper feeder which is associated with a vibrating chute.

21. The apparatus of claim **13** wherein the impregnating means comprises a spraying means associated with squeezer means disposed above a collecting trough.

22. The apparatus of claim **21** wherein recycle means are provided for recycling the treatment medium from the collecting trough to the spraying means.

23. The apparatus of claim **13** wherein the material being treated is introduced into the steam-treatment chamber by a conveyor belt which has a speed which can be varied independently of the steam-treatment chamber conveyor belt.

24. The apparatus of claim **13**, wherein between the suction drum bowl and the sieve drum dryer an opener is arranged wherein the washed fiber fleece leaving the suction bowl is opened to provide for a more uniform drying of said fiber fleece.

25. An apparatus for the continuous treatment of materials which comprises, in combination, a feeder means, an impregnating means composed of a vibrating chute provided with a dyestuff applicating device disposed thereabove, a steam-treatment chamber disposed after the impregnating means composed of a vibrating chute provided with a dyestuff applicating device disposed after the impregnating means, said steam-treatment chamber provided with a conveyor belt means, means for conveying the material being treated from the impregnating means to the steam-treatment chamber and for introducing said material into said chamber in thick folds, at least one suction drum bowl provided behind the steam-treatment chamber, each suction drum bowl containing a squeezer means associated therewith, a feeder means arranged between the steam-treatment chamber and the suction drum bowl, said feeder means rearranging the thick material leaving the steam-treatment chamber to form a thinner fiber fleece to be fed to said suction drum bowl, sieve drum dryer means provided after the suction drum bowl for drying the material being treated and opener means disposed between the suction drum bowl and the sieve drum dryer to open said material before drying thereby providing for a more uniform drying of said material.

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